

vinyl aromatic homopolymeric sequences in the copolymer block. The term does not include the presence of comonomers and does not include copolymer blocks.

On page 9 of the specification, a method for determining the block rate of the "vinyl aromatic hydrocarbon polymer block" in the block copolymer is specified. That is, the block copolymer (comprising a vinyl aromatic hydrocarbon and a conjugated diene) before hydrogenation is subjected to oxidative degradation using t-butyl hydroperoxide in the presence of osmium tetroxide as a catalyst according to the KOLTHOFF method.

A copy of a document relating to the KOLTHOFF method is enclosed as Exhibit A.

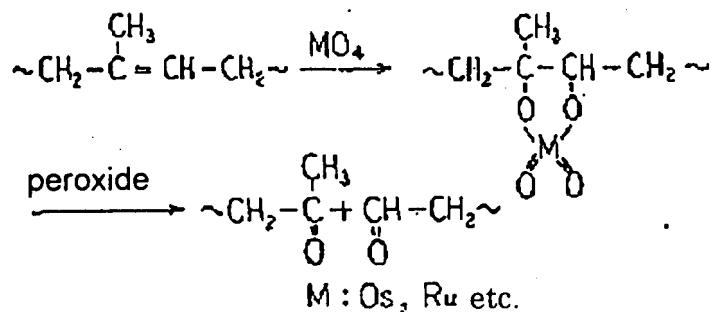
Applicants would like to point out that the resulting polymer components obtained through the KOLTHOFF method consist of vinyl aromatic hydrocarbon homopolymeric sequences. (This is explained in more detail below).

In other words, the block rate as defined by the expression on page 9 expresses the rate of the resulting vinyl aromatic hydrocarbon polymer block components detected through the KOLTHOFF method, i.e., vinyl aromatic hydrocarbon homopolymeric sequences. Since the definition of the vinyl aromatic hydrocarbon block on page 9, lines 2-3 is given in connection with the block rate, the "block" referred to herein also means vinyl aromatic hydrocarbon homopolymeric sequences.

The KOLTHOFF method can be summarized as follows. Treatment with t-butyl hydroperoxide in benzene (good solvent) in the presence of osmium tetroxide as a catalyst cuts the double bond portion in butadiene. The resulting polymer components

are allowed to precipitate in ethanol (poor solvent), and then the precipitates are subjected to separation by filtration with a glass filter. The filtration residue is weighed.

An oxidative degradation reaction according to the KOLTHOFF method (in the case of isoprene) is as follows.



That is, by the oxidative degradation reaction according to the KOLTHOFF method, the conjugated diene parts in the block copolymer comprising a vinyl aromatic hydrocarbon and a conjugated diene are separated off and only vinyl aromatic hydrocarbon homopolymeric sequences are taken out.

This is supported by the data shown in Table 2 on page 432 of document A where mixtures of GR-S (free of polystyrene impurity) and polystyrene (prepared by emulsion polymerization) were decomposed by the KOLTHOFF method and the weight of the resulting polystyrene parts was measured. The results in Table 2 show that the same weight of polystyrene as that added was detected. From the results, it is evident that polybutadiene parts are all separated off.

This document discloses the method for filtration separation of the precipitates which are the product of the oxidative degradation reaction of a polymer, but does not disclose any detail of the measurement of the molecular weight of the filtration residue.

In the present invention, the oxidative degraded precipitates were subjected to filtration with a glass filter (11G4: capacity of 11 ml and maximum pore size of 5 to 10 µm) according to the method disclosed in the document. The molecular weight of the resulting filtration residue was measured and it was confirmed that vinyl aromatic hydrocarbon polymer components having an average polymerization degree of about 30 or less had been separated. For this reason, the proviso concerning the polymerization degree has been included. See page 9, lines 12-15 of the specification. The reason why the word "about" is used is because the separation does not clearly occur at the boundary of an average polymerization degree of 30 (which may be due to precipitation with ethanol and filtration with a glass filter).

For information, when copolymer blocks (comprising a vinyl aromatic hydrocarbon and a conjugated diene) in the copolymer contain vinyl aromatic hydrocarbon sequences having an average polymerization degree of about 30 or more, they are also taken out by the KOTHOFF method and counted as the "vinyl aromatic hydrocarbon polymer blocks."

Thus it is submitted that it is clear from the specification and the Exhibit A that the term "vinyl aromatic hydrocarbon polymer blocks" in the specification and claims, means only vinyl aromatic hydrocarbon homopolymer blocks and sequences in the claimed block copolymer, and does not include copolymer blocks.

A limitation in claim 1 is that in the block copolymer, "40 to 80%" by weight of the vinyl aromatic hydrocarbon polymer blocks "have a molecular weight of 35,000 or less."

Knoll relates to a block copolymer of a block A having polymerized units of a vinylaromatic monomer and a block B/A having polymerized units of a vinylaromatic

monomer and of a diene. See column 2, line 50-55 of Knoll. Example 1 in Table 1 of Knoll discloses an example of such a block copolymer of polymerized units of styrene (Styrene 1 and Styrene 5) and polymerized units of styrene and butadiene (Styrenes 2, 3 and 4). In other words, homopolymer blocks (Styrenes 1 and 5) and copolymer blocks (Styrenes 2, 3 and 4).

In Table 1 of Knoll, the molecular weights of the homopolymer blocks, Styrene 1 and Styrene 5 in the block copolymer, are each 18,000 (1008 (Weight of Styrene 1 or 5)/9612 (total monomer amount in Example 1) x 172000 (Mw in Example 1)). With regard to the remaining copolymer blocks (Styrenes 2, 3 and 4), it cannot be considered from the polymerization process used (see Comparison of Present Invention and Knoll on pages 2-4 of the Reply filed December 28, 2006) that they include any styrene homopolymer sequences satisfying the definition of the above-mentioned "vinyl aromatic hydrocarbon polymer block" (i.e., ones having a polymerization degree of about 30 or more).

Accordingly, the copolymer blocks of Example 1 of Knoll cannot be counted as "vinyl aromatic hydrocarbon polymer blocks." Consequently, in the block copolymer of Example 1 of Knoll, all or 100% of the vinyl aromatic hydrocarbon homopolymer blocks have a molecular weight of 35,000 or less.. This does not satisfy the quoted requirement of claim 1 that only 40 to 80% of the blocks have such a molecular weight.

Thus, it is submitted that neither claim 1 nor any of claims 2-25 dependent therefrom can be considered to be anticipated by Knoll. If Styrenes 2-4 of Example 1 of Knoll do not contain any homopolymer sequences for the reasons demonstrated and Styrenes 1 and 5 are the only homopolymer blocks that have a molecular weight of less

than 35,000, how then can the block copolymer have only 40 to 80% of such blocks?

Withdrawal of Knoll as a ground of rejection of these claims under §102(b) is therefore requested.

When 40 to 80% by weight of the vinyl aromatic hydrocarbon homopolymer blocks have a molecular weight of 35,000 or less, a heat shrinkable film excellent in natural shrinkability and low-temperature shrinkability can be obtained. See page 11, line 11-15 of the specification. In contrast, a heat shrinkable film produced from the block copolymer of Knoll will have too great a shrinkability at 80°C and poor resistance to fusion bonding in hot water. Therefore, it cannot achieve the physical property balance as required in the present invention.

Accordingly, the claims cannot be considered to be obvious over Knoll either. Its withdrawal as a ground of rejection under §103(a) is therefore also requested.

It is believed claims 1-25 are in condition for allowance.

In view of the foregoing remarks, Applicants submit that this claimed invention, as amended, is neither anticipated nor rendered obvious in view of the prior art reference cited against this application. Applicants therefore request the entry of this Reply, the Examiner's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge
any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: May 15, 2007

By: 
Arthur S. Garrett
Reg. No. 20,338
Tel: 202 408 4091

Attachments: Exhibit A - Kolthoff et al.
article - 5 pages

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